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Japanese Published Unexamined (Kokai) Patent Application No. S61-89916, published May 8, 1986; Application No. S59-212127, filed October 9, 1984; Int. Cl.<sup>4</sup>: F01N 3/28; Inventor(s): Yoshihiko Kitamura et al.; Assignee: Nippon Leinz Corporation and Dainichi Nippon Cables Corporation; Japanese Title: Haikigasujoukasouchi no Totsubutsuki Shiirumatto (Seal Mat with Grooves for an Exhaust Gas Purifier)

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**1. Title of Invention**

**Seal Mat with Grooves for an Exhaust Gas Purifier**

**2. Claim**

1. A seal mat for an exhaust gas purifier with an integrally formed honeycomb catalyst stored into a casing, that has grooves which are made of a heat resistant fiber wound around the side circumferential area of said honeycomb catalyst and which decreases the generation of excessive surface pressure in relation to said honeycomb catalyst.

**3. Detailed Description of the Invention**

**[Field of Industrial Application]**

This invention pertains to seal mats with grooves for exhaust gas purifiers, which are used while they are wound around honeycomb catalysts, have an improved winding performance, and which have an excellent air-tight capability.

**[Prior Art]**

Seal mats made of thermal resistant fibers are conventionally known (as an example,

the intaramu mat [Translator's Note: the product name is not located in any dictionary] that is formed such that a ceramic fiber and vermiculite are bonded with each other by applying a binder; produced by 3M Corporation in the U.S.), which are used while they are wound around the side circumferential areas of honeycomb catalysts for purification of auto mobile exhaust gases and the like; said honeycomb catalysts are comprised of cylinders made of ceramics and the like and of catalysts. Said seal mats have been proposed as a means to improve the sealing capability because the ratio of the leaked portion of exhaust gases reaches 5 to 7% when prior art wave nets are wound around the side circumferential areas of honeycomb catalysts.

**[Problem of Prior Art to Be Addressed]**

However, when said mats are wound up to more than the halfway in the length direction on the side circumferential areas of honeycomb catalysts and when said wound mats are stored into casings (Fig.2), honeycomb catalysts are damaged during pressing, which is a disadvantage of prior art seal mats. Said damage is caused by an extremely large non-uniformity at the finished outer diameters of said currently used honeycomb catalysts. Said non-uniformity causes the non-uniformity of compression force of the seal mats when honeycomb catalysts are stored into casings, depending on the non-uniformity level on the size of the gap between the honeycomb catalysts and casings; when the seal mats are excessively compressed, the honeycomb catalysts are damaged due to compression reaction.

**[Measures to Solve the Problem]**

The present invention is produced to propose a new seal mat that can eliminate a disadvantage as described above; said present invention offers said seal mat for an exhaust gas purifier with an integrally formed honeycomb catalyst stored into a casing, that has grooves which are made of a heat resistant fiber wound around the side circumferential area of said honeycomb catalyst and which decreases the generation of excessive surface pressure in relation to said honeycomb catalyst.

[Embodiment and Effect]

Fig.1 is a perspective view of an embodiment of the present invention; grooves 1a are continuously provided onto both surfaces of a seal mat 1 in the longer lateral direction.

Fig.2 is a cross-sectional view illustrating a condition wherein a honeycomb catalyst 2 is stored into a stainless steel casing 3 using the seal mat of Fig.1. Seal mat 1 is presented between honeycomb catalyst 2 and casing 3 at a condition that is properly compressed through a storing process as described below, in order to improve the sealing performance of seal mat 1. By means of this, when excessive compressed force is applied, a part of ridges b on the surface of seal mat 1 moves to grooves 1a; by means of this, the compressed force is reduced; as a result, the damage level of the honeycomb catalyst is significantly reduced. Even though a compression reduction effect is obtained as described above using grooves 1a, ridges b on both surfaces of seal mat 1 are still adhered onto honeycomb catalyst 2 or inside casing 3; because of this, seal mat 1 can maintain excellent sealing performance.

The effect as described above is attained by grooves that are provided onto the surface of a seal mat of the present invention. As long as said effect is obtained, any shape, any

number, and any arrangement means can be used for the grooves. For example, grooves with a wave surface, grooves with a groove that has an in-line arrangement, or grooves with discontinuous multiple depressions can be given other than grooves as shown in Fig.1. The size of grooves is determined by the gap between honeycomb catalyst 2 and casing 3, the thickness of the seal mat, compression resistance, and the like. As an example, when the gap as mentioned above is defined as 1.5 to 4 mm, the thickness of the seal mat before compression is applied is defined as about 5 mm, and when a 65% compression thereof is defined as 70 to 150 Kgf/cm<sup>2</sup>, it is preferred that continuous grooves with a 2 mm depth and 2 mm width are provided onto at least one surface of the seal mat at intervals of 2 to 10 mm.

Seal mat 1 of the present invention is made of a heat resistant fiber, such as asbestos, rock wool, a ceramic fiber, a carbon fiber, a glass fiber, a slag wool, and a metal fiber, in order to endure a high temperature of an exhaust gas. A tape that is formed out of a fine fiber is preferably used with respect to air-tight capability.

A seal mat of the present invention can be manufactured such that a heat resistant adhesive, such as an alkaline metal silicate based inorganic adhesive, phosphate based inorganic adhesive, or alkylsilicate based inorganic adhesive, is impregnated into heat resistant fiber non-woven cloths; said non-woven cloths with the heat resistant adhesive impregnated are laminated; or such that a liquid adhesive that contains a substance which melts at a lower melting point than that of a heat resistant fiber to be used and at a higher temperature than that of an exhaust gas supplied into a purifier, such as an aluminum powder, a calcium powder, a lead powder, a barium powder, sodium chloride, and calcium chloride, is impregnated into heat resistant fiber non-woven cloths; said non-woven cloths with a liquid

adhesive impregnated are laminated to form a mat; said formed mat is heated; said substance is melted; next, said melted substance is cooled and solidified; by using said solidified substance, a mat with a heat resistant fiber adhered is obtained. The liquid adhesive that is used for the latter method usually disappears after it has been ashed and the like. An expandable additive by heat, such as vermiculite, can be added to the seal mat.

#### **[Advantageous Result of the Invention]**

By using a seal mat of the present invention, even though a currently used honeycomb catalyst that demonstrates a significant non-uniformity at the finished outer diameter is used, the damage level of the honeycomb catalysts during ashing is markedly reduced; for said reason, when an exhaust gas purifier is produced, an improved yield is obtained. Also, said obtained purifier has an excellent sealing performance.

#### **[Comparative Example and Application]**

The intaramu mat (product name; produced by 3M corporation in the U.S.) at a 5 mm thickness at a 16 cm width, with a 90 Kgf/cm<sup>2</sup> compression resistance when the compression rate in the thickness direction at a normal temperature is 65% (thickness at a compressed condition is 1.75 mm) is wound around the side circumferential area of a ceramic honeycomb catalyst of a 20 cm length and 10 cm diameter once; said wound intaramu mat is stored into one side of a stainless steel half casing; next, said side with wound intaramu mat stored is covered with the other side of the casing; said both sides of the half casing are pressed until the location where both sides are welded are brought into contact with each other. The gap

between the honeycomb catalyst and the inner surface of the casing at the completion of pressing is 2.0 mm.

When the pressing work as described above is repeated 5 times; the honeycomb catalyst inside is broken 3 times out of 5 times of the pressing works due to pressing as described above.

Next, vertical grooves at a 2 mm depth and a 2 mm width are provided onto both surfaces of a mat that is obtained from the same production batch as that of said intaramu mat and that has the same size as the intaramu mat, at intervals of 5 mm; by using said vertical grooves, the same pressing work described above is repeatedly performed 5 times; no breakage occurs to a honeycomb catalyst.

#### **4. Brief Description of the Drawings**

Fig.1 is perspective view of a seal mat as in an embodiment; Fig.2 is across-sectional view illustrating an example of the structure of an exhaust gas purifier with a seal mat used.

**1...Seal mat**

**1a...Grooves that are provided onto the surface of a seal mat**

**2...Honeycomb catalyst**

**3...Casing**

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Chisato Morohashi**

Patent Abstracts of Japan

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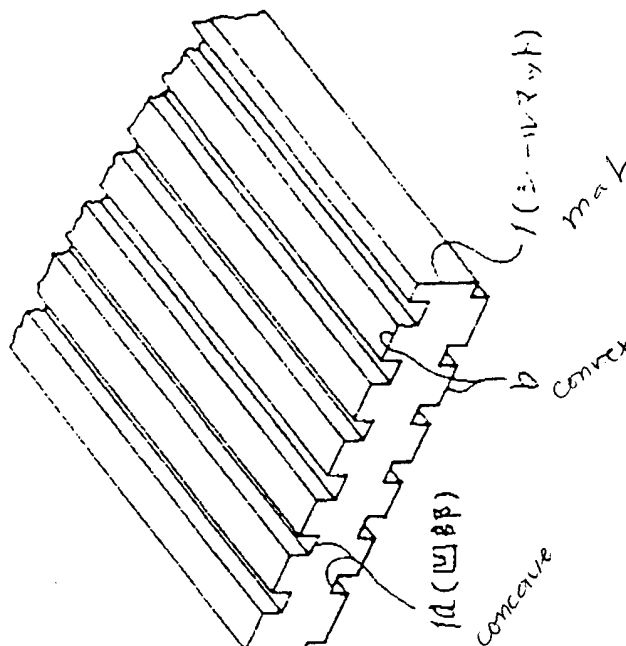
APPLICATION DATE : 09-10-84  
APPLICATION NUMBER : 59212127

APPLICANT : DAINICHI NIPPON CABLES LTD;

INVENTOR : SUGIYAMA AKEMASA;

INT.CL. : F01N 3/28

TITLE : SEAL-MAT WITH CONCAVES FOR  
EXHAUST GAS PURIFYING DEVICE



ABSTRACT : PURPOSE: To reduce excessive occurrence of surface pressure to honeycomb catalyzer by providing concaves on one side or both sides of a seal-mat consisting of heat-resistant fiber.

CONSTITUTION: A seal-mat 1 consists of heat-resistant fiber such as asbestos, rock wool, ceramic fiber, carbon fiber, etc. Concaves 1a of optional profile and amount are provided on one side or both sides of the seal-mat. Providing means of concaves are also optional. Owing to the concave provision, when excessive compression is applied, one part of convex portions (b) of the surface of seal-mat 1 moves to the concave portions 1a and the compression is reduced, and as a result, breaking possibility of honeycomb catalyzer is largely lowered.

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⑭ 発明の名称 排気ガス浄化装置の凹部付シールマット

⑮ 特 願 昭59-212127

⑯ 出 願 昭59(1984)10月9日

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## 明 細 書

1. 発明の名称 排気ガス浄化装置の凹部付シールマット

## 2. 特許請求の範囲

1. 一体に形成されたハニカム触媒をケースに収容してなる排気ガス浄化装置における前記ハニカム触媒の側周部に巻き付けられる、耐熱性繊維からなり、前記ハニカム触媒に対する過度の面圧発生を緩和する凹部を片面又は両面に有するシールマット。

## 3. 発明の詳細な説明

## (利用分野)

本発明は、排気ガス浄化装置におけるハニカム触媒に巻回して使用される、巻回特性が改善された気密性にすぐれる凹部付シールマットに関するものである。

## (従来の技術)

従来、ハニカム形に一体成形されたセラミック製の筒体と触媒とからなる自動車排気ガスなどを浄化するためのハニカム触媒の側周部に巻回

されて使用される耐熱性繊維からなるシールマット(たとえば、セラミック繊維とひる石とをバインダで結合してなる米国3M社製の商品名:インダラムマット)が知られていた。これは、それまでの波形状の金網をハニカム触媒の側周部に巻回する方式では、排気ガスのリーク分の割合が5~7%にも達するため、そのシール性を高める手段

として提案されたものである。[解決すべき問題点]

しかしながら、上記のマットをハニカム触媒の側周部における長さ方向の半分以上にわたって巻回し、これをケースに収容した場合(第2図)そのアッシー時にハニカム触媒が破損するという問題があった。この破損問題は、現用の前記ハニカム触媒の仕上り外径に極めて大きなバラツキがあることに原因がある。このバラツキが、ハニカム触媒と前記ケースとの間隙の大きさのバラツキ、従って、ハニカム触媒をケースに収容したときのシールマットの圧縮力のバラツキに反映されることとなり、シールマットが過度に圧縮されたとき

その圧縮応力によりハニカム触媒が破損することとなる。

〔問題点の解決手段〕

本発明は、上記の問題点を克服し得る新規なシールマットを提案するものであって、

一体に形成されたハニカム触媒をケースに収容してなる排気ガス浄化装置における前記ハニカム触媒の側周部に巻き付けられる、耐熱性繊維からなり、前記ハニカム触媒に対する過度の面圧発生を緩和する凹部を片面又は両面に有するシールマットを提供するものである。

〔実施例、作用〕

第1図は、本発明の実施例の斜視図であって、シールマット1の両面にマットの長手方向に連続する凹部1aが設けられている。

第2図は、第1図のシールマットを用いてハニカム触媒2をステンレス製のケース3に収納した状態の断面図である。シールマット1によるシール性を良好とするために、シールマット1は、後記する収納工程を経て適度に圧縮された状態でハ

ニカム触媒2とケース3との間に介在せしめられている。これにより、過度の圧縮力がかけられた場合にシールマット1の表面の凸部bの一部が凹部1aに移行して圧縮力が緩和され、その結果、ハニカム触媒の破損度が大幅に低下する。なお、凹部1aによる上記した圧縮力緩和作用があっても、シールマット1の両面の凸部bは依然としてそれぞれハニカム触媒2の表面又はケース3の内面に密着しているのでシールマット1は良好なシール性を維持する。

本発明におけるシールマットの表面に設けられる凹部は上記した作用をなすものである。かかる作用をなす以上、凹部についての形状、設ける量、設け方などは任意であってよい。たとえば、第1図に示すもののほか、表面を波形としたりしたもの、茶盤目の溝を設けたもの、あるいは不連続の窪みを多数設けたものなどをあげることができる。凹部の大きさはハニカム触媒2とケース3との間隔、シールマットの厚さ、圧縮抵抗などにより決定される。たとえば、上記間隔が1.5～4mm、シール

マットの圧縮前の厚さが約5mm、その65%圧縮抵抗が70～150kgf/cm<sup>2</sup>の場合においては、深さ2mm、幅2mmの連続溝をシールマットの少なくとも片面に2～10mm間隔で設けることが適当である。

本発明のシールマット1は、排気ガスの高温に耐えるものとするために例えば石綿、岩綿、セラムミック繊維、カーボン繊維、ガラス繊維、スラグウール、金属繊維のような耐熱性繊維から形成されている。微細な繊維からなるテープが気密性の点で好ましく用いられる。

本発明のシールマットの製造は、例えば耐熱性繊維の不織布に、アルカリ金属ケイ酸塩系無機接着剤、リン酸塩系無機接着剤、アルキルシリケート系無機接着剤のような耐熱接着剤を含浸させてこれを積層することにより行うこともできるし、アルミニウム粉、カルシウム粉、鉛粉、バリウム粉、塩化ナトリウム、塩化カルシウムのような用いる耐熱性繊維よりも低融点で、浄化装置に流入する排気ガスの温度よりも高い温度で熔融する物

質を含有する液状の接着剤を耐熱性繊維の不織布に含浸させてこれを積層し、形成されたマットを加熱処理して前記物質を熔融させ、ついで冷却固化させて前記物質で耐熱性繊維が接着されたマットとすることによっても行うことができる。後者の方法においては用いた液状の接着剤は通常、加熱処理の過程で灰化等して消失する。なお、シールマットにはひる石などの加熱膨張性の添加物が加えられていてもよい。

〔発明の効果〕

本発明のシールマットを用いれば、仕上り外径のパラッキの大きい現用のハニカム触媒を用いてもアッシー時におけるハニカム触媒の破損率が大幅に低下するため排気ガス浄化装置の生産の際の歩留りが良く、しかも得られた浄化装置はシール能が優れている。

〔比較例、適用例〕

厚さ5mm、幅16mm、常温での厚さ方向の圧縮率が65%（圧縮状態での厚み：1.75mm）のときの圧縮抵抗が90kgf/cm<sup>2</sup>のインタラムマット（商

品名、米国3M社製)を、直径10mm、長さ20mmのセラミック製ハニカム触媒の側周部に1回巻回して、これをステンレス製の半割ケースの一方に収容し、次いで他方のケースをその上にかぶせて、両半割ケース同士の接合する箇所が接触するまで圧迫した。圧迫完了時におけるハニカム触媒とケース内面との間隙は2.0mmであった。

上記のアッシー作業を5回行ったところ、うち3回は、上記の圧迫により内部のハニカム触媒が破損した。

次に、上記のインタラムマットと同じ生産ロットから採取した上記同寸法のマットの両面に深さ2mm、幅2mmの縦溝を5mm間隔に設けたものを用いて上記と同じアッシー作業を5回繰り返したところ、ハニカム触媒の破損は皆無であった。

#### 4. 図面の簡単な説明

第1図は実施例のシールマットの斜視図、第2図はシールマットを適用した排気ガス浄化装置の構造例を表わした断面図である。

1：シールマット、1a：シールマットの表面

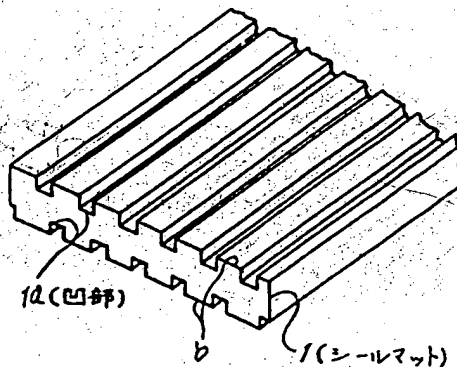
に設けられた凹部、2：ハニカム触媒、3：ケース。

特許出願人 日本ラインツ株式会社

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第1図



第2図

